

STRETCH CODE WORKSHOP

A Green Step Ahead: A Workshop for Municipalities
Considering Adopting the Stretch Code

March 16, 2010



1

Northampton Energy and Sustainability Commission

STRETCH CODE WORKSHOP

The Northampton Energy and Sustainability Commission would like to extend a special "Thank You" to the following individuals:

Jim Barry, Department of Energy Resources (DOER)

Mark Price, Steven Winter Associates, Inc.

Dan Hellyer, Town of East Longmeadow

Delbert Smith Jr., Consulting Engineering Services (CES), Inc.

2

STRETCH CODE WORKSHOP

● Introduction, Louis Hasbrouck

- Introduction to the Stretch Code, *Jim Barry*
- The HERS Rating System, *Mark Price*
- Stretch Code Requirements, *Dan Hellyer*
- Building Code Requirements, *Louis Hasbrouck*
- Projected Costs, *Del Smith*
- Closing Remarks, *Chris Mason*

3

Sustainable Northampton Plan

- Goal: Reduce community's and City's energy demand and natural resource consumption
- Goal: Reduce greenhouse gas emissions
 - Specified Action: petition the Commonwealth of Massachusetts for the right to adopt a code with a stronger energy efficiency component than the standard building code.
 - *Adoption of the stretch code would have the same effect.*

4

Green Communities Act

- ▶ Eligibility criteria are compatible with City's energy and greenhouse gas emission reduction goals
- ▶ Opens up grant opportunities from annual \$7 million Green Community grant monies, for example:
 - Efficiency improvements or renewable energy for City buildings
 - City support for higher efficiency in new construction and energy retrofits in residential and commercial buildings
 - Other applications that meet state energy reduction goals

5

City Actions

- ▶ Mayor Higgins commits City to becoming a Green Community and the Northampton Energy and Sustainability Commission (NESC) develops a Green Community Action Plan that includes:
 - Building Inspector, NESC, and other City staff investigate the requirements and costs associated with adoption of stretch code
 - Informal education/outreach to interested persons
 - Hold informational public presentation to answer City Council, local builders, property owners questions
 - Request City Council hold a Public Hearing and schedule a vote

6

New construction and additions past 5 years

- 98 new single family homes: estimated costs \$29,375,000
- 23 new multi family dwellings: estimated costs \$21,175,000
- 28 new commercial buildings: estimated costs \$79,500,000
- 313 additions, both residential and commercial: estimated costs \$36,500,000
- 804 commercial permits: estimated costs \$218,350,000
- 4493 residential permits: estimated costs \$100,260,000
- The estimated costs of nearly half of all residential construction is less than \$10,000

7

STRETCH CODE WORKSHOP

- Introduction, *Louis Hasbrouck*
- **Introduction to the Stretch Code, *Jim Barry***
- The HERS Rating System, *Mark Price*
- Stretch Code Requirements, *Dan Hellyer*
- Building Code Requirements, *Louis Hasbrouck*
- Projected Costs, *Del Smith*
- Closing Remarks, *Chris Mason*

8



Helping Massachusetts Municipalities Create A Greener Energy Future

Green Communities Program

- DOER Programs & Support for Municipalities
 - Energy Audit Program (EAP)
 - Energy Performance Contracting with ESCo Technical Assistance
 - Mass Energy Insight
 - **Green Communities Grant, and Technical Assistance Program**
 - Outreach; Regional Coordinators



9



Helping Massachusetts Municipalities Create A Greener Energy Future

Green Communities Grant Program

- Provides up to \$10M annually in grants and loans to qualifying communities
- Qualification Criteria
 1. Adopt as-of-right siting, in designated locations, for RE/AE generation, or RE/AE R&D, or RE/AE manufacturing
 2. Adopt expedited (12 month) application/permitting process
 3. Establish an energy use baseline inventory with a program to reduce baseline by 20% in 5 years
 4. Purchase only fuel-efficient vehicles
 5. **Require all new residential construction > 3000 ft² and new commercial and industrial real estate construction to minimize life-cycle energy costs.**

DOER has determined that a municipality can meet this requirement by adopting the BBRs Stretch Code.



10



Helping Massachusetts Municipalities Create A Greener Energy Future

Stretch Code ...what is it ?

- International Codes Council (ICC) publishes the International Energy Conservation Code (IECC) every 3 years (2006, 2009....).
- Mass Board of Building Regulations and Standards (BBRS) has adopted the IECC 2009 energy code for 2010 along with the optional Stretch code appendix.
- Stretch code uses real-world testing to ensure residential energy savings, and energy modeling to ensure commercial energy savings.



11



Helping Massachusetts Municipalities Create A Greener Energy Future

Stretch Code for New Residential Construction

New low-rise (three stories or less) residential buildings shall require a HERS (Home Energy Rating System) index rating as verified by a RESNET (Residential Energy Services Network) certified HERS rater.

- For units equal to or greater than 3,000 sq ft in conditioned floor space, a HERS rating of 65 or less is required.
- For units less than 3,000 sq ft, a HERS rating of 70 or less is required.
- In addition, all new construction shall demonstrate compliance with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist.

Performance based, not prescriptive.




12

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES
Helping Massachusetts Municipalities Create A Greener Energy Future

Why Test Performance?

Prescriptive codes don't guarantee good installation, air and water tightness, or that thermal insulation is effective.

Small air gaps can reduce insulation R-values by 50% or more.



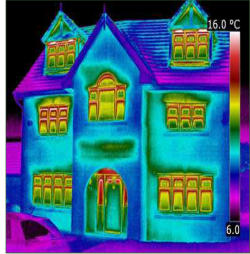
13

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES
Helping Massachusetts Municipalities Create A Greener Energy Future

Why Test Performance?

Design, Installation & Equipment all important.

- Blower-door test for air leakage
- Duct test for heating & AC
- Infra-red camera tests thermal barrier install.



14


GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES
Helping Massachusetts Municipalities Create A Greener Energy Future

'Stretch Code' and 'Energy Star'

The Stretch appendix puts the current Energy Star homes program (at Tier 2 level) into code.

All new residential construction can use the Energy Star homes program to receive:

- Builder incentives/rebates
 - \$1250/home for HERS 65
 - other utility incentives – on appliances, fluorescent lights, etc.
- Builder training and materials
- Subsidized HERS raters




15

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES
Helping Massachusetts Municipalities Create A Greener Energy Future

Incentives, Rebates, Tax Credits

- Stretch code is designed to allow builders to get the maximum benefits of the existing Energy Star Program
- Additional rebates available for installing high efficiency heating and cooling equipment, appliances and lighting.
- Utility companies partially cover the cost of hiring a HERS rater in certain cases.
- \$2000 federal tax credit for homes built with less than half of the heating and cooling load of a 2004 code home. HERS rater can tell you if your new home qualifies.




16

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES
Helping Massachusetts Municipalities Create A Greener Energy Future

Energy Efficient Mortgages

- Energy Efficient Mortgages make it easier for borrowers to qualify for loans to purchase homes that are already energy efficient or to cover the expenses for making cost-effective energy improvements when purchasing or refinancing older existing homes.
 - Conventional Energy Efficient Mortgages
 - FHA Energy Efficient Mortgages
 - VA Energy Efficient Mortgages

Handout available



17

GREEN COMMUNITIES PROGRAM
DEPARTMENT OF ENERGY RESOURCES
Helping Massachusetts Municipalities Create A Greener Energy Future

Adoption by Towns and Cities

- Adoption Process
 - Building Official Training
 - Municipal Public Hearing
 - Vote of City Council
- Timing of Adoption
 - Northampton can vote any time
 - Code change starts on January 1 or July 1
 - Base code & Stretch code both in place for the first 6 months (concurrency period)
 - Builder can choose EITHER code

18



Helping Massachusetts Municipalities Create A Greener Energy Future

Implementation Timeline example

- Example of adoption by Northampton, MA
 - March 29, 2010 - Municipal public hearing
 - April 12, 2010 - Vote of City Council to adopt Stretch Code
 Northampton is eligible to become a Green Community and can apply for this fiscal year grant.
- Timing of code implementation in Northampton
 - July 1, 2010 Stretch code implemented alongside base code in Northampton
 - July 1→Dec 31, 2010 Building permits can comply with either base code (IECC 2009) or Stretch code until Dec 31, 2010
 - Jan 1, 2011 Stretch code becomes sole energy code in Northampton– for new building permits

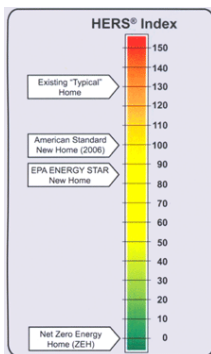
19

STRETCH CODE WORKSHOP

- Introduction, *Louis Hasbrouck*
- Introduction to the Stretch Code, *Jim Barry*
- **The HERS Rating System, *Mark Price***
- Stretch Code Requirements, *Dan Hellyer*
- Building Code Requirements, *Louis Hasbrouck*
- Projected Costs, *Del Smith*
- Closing Remarks, *Chris Mason*

20

Steven Winter Associates, Inc.



Home Energy Rating System HERS

- "Typical" Existing Homes range from 110-150
- "Typical" Newly Constructed Homes 90-110
- Energy Star Homes
 - 85 and lower
- Stretch Code Homes
 - 85 for renovations < 2,000 sf
 - 80 for renovations ≥ 2,000 sf
 - 70 for new homes < 3,000 sf
 - 65 for new homes ≥ 3,000 sf
- Zero Energy Homes
 - 0 and lower

Steven Winter Associates, Inc.

History of HERS

- 1995 Founders
 - Natl Assoc. of State Energy Officials
 - National mortgage industry
 - Energy Rated Homes of America
- Purpose
 - Promote the market for home energy ratings and EEMs
- Organization Created
 - RESNET – Residential Energy Services Network

Steven Winter Associates, Inc.

Recognition

- Mortgage industry
- Financial industry
- Federal Government for verification:
 - Federal tax credit qualification
 - EPA ENERGY STAR labeled homes
 - U.S. Department of Energy Building America program
- Used for minimum code compliance in 16 states

Steven Winter Associates, Inc.

Who is Involved?

- Rater Providers
- Rater Trainers
- QAD
- Raters
- Testing

HERS Process – Step 1 Proposed Design Modeling

- Review Building Plans
 - Data collection – insulation, windows, wall to window ratio, HVAC efficiency, building orientation, DHW, air and duct leakage
- Create Model
 - REMRate Software Modeling
 - Standard and Proposed Building
 - US Labs certifies software

25

HERS Process – Steps 2 and 3 - Onsite Inspections and Finalize Model

- **First Inspection**
 - Thermal Bypass Checklist
 - Duct tightness test (if applicable)
- **Second Inspection** (often combined with 1st)
 - Insulation
- **Final Inspection**
 - Blower door test
- **Finalize Energy Model**
 - Based on verified performance and equipment
- **Cost**



STRETCH CODE WORKSHOP

- Introduction, *Louis Hasbrouck*
- Introduction to the Stretch Code, *Jim Barry*
- The HERS Rating System, *Mark Price*
- **Stretch Code Requirements, *Dan Hellyer***
- Building Code Requirements, *Louis Hasbrouck*
- Projected Costs, *Del Smith*
- Closing Remarks, *Chris Mason*

27

MA Building Code Overview

- New Standard Building Code (in effect January 1, 2010)
 - Residential: IECC 2009
 - Commercial: ASHRAE 90.1 2007
- Stretch Code
 - Residential: ~20% better than New Building Code (IECC 2009)
 - 65 for new homes ≥ 3,000 sf
 - 70 for new homes < 3,000 sf
 - 80 for renovations ≥ 2,000 sf
 - 85 for renovations < 2,000 sf
 - Commercial: 20% better than ASHRAE 90.1 2007

28

Stretch Code Requirements

RESIDENTIAL: NEW HOMES

Residential 3 Stories or less

- New homes 3,000 sf or more requires a Home Energy Rating System (HERS) index of 65 or less.
- New homes below 3,000 sf require a HERS index of 70 or less.
- All new residential construction 3 stories or less requires verification of HERS index rating by a Residential Energy Services Network (RESNET) certified HERS rater.
- Must demonstrate compliance with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist (in the handout).

Inspection Item	Pass	Fail	Notes
1. Thermal Bypass Checklist	<input type="checkbox"/>	<input type="checkbox"/>	
2. Duct Tightness Test	<input type="checkbox"/>	<input type="checkbox"/>	
3. Insulation	<input type="checkbox"/>	<input type="checkbox"/>	
4. Windows	<input type="checkbox"/>	<input type="checkbox"/>	
5. Doors	<input type="checkbox"/>	<input type="checkbox"/>	
6. Attic	<input type="checkbox"/>	<input type="checkbox"/>	
7. Basement	<input type="checkbox"/>	<input type="checkbox"/>	
8. Crawlspace	<input type="checkbox"/>	<input type="checkbox"/>	
9. Garage	<input type="checkbox"/>	<input type="checkbox"/>	
10. Other	<input type="checkbox"/>	<input type="checkbox"/>	

29

Stretch Code Requirements

RESIDENTIAL: ADDITIONS

- Prescriptive option – must conform to the most recent Energy Star for Homes Prescriptive Builders Option Package (BOP, included in the handout) and be in compliance with The Energy Star Qualified Homes Thermal Bypass Inspection Checklist and envelope requirements of IECC 2009.
- Performance option – In lieu of prescriptive option and must meet the requirement for new homes.

Building System	Insulation	Windows	Doors	Attic	Basement	Crawlspace	Garage	Other
1. Thermal Bypass Checklist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Duct Tightness Test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Insulation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Windows	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Doors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Attic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Basement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Crawlspace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Garage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30

Stretch Code Requirements

RESIDENTIAL: ALTERATIONS, RENOVATIONS AND REPAIRS

- Prescriptive option – Alterations, renovations, or repairs that access the building envelope require compliance with the prescriptive option for residential additions. Insulation requirement of R-3.5/inch.
- Performance option – In lieu of prescriptive option and must meet the following HERS indexes:
 - o 80 or less for units equal or greater than 2,000 sf
 - o 85 or less for units less than 2,000 sf
 - o Compliance with the Energy Star Thermal Bypass Checklist

31

Residential Compliance Summary

Residential Compliance Paths			
	IECC 2009	Stretch Code New Construction	Stretch Code Renovations and Additions
Prescriptive Path	R Value – No Trade Offs U Factor – No Trade Offs Takes thermal bridging into account (REScheck) Total UA Factor – Trade offs allowed between components (REScheck)	N/A	Energy Star for Homes Prescriptive Builders Option Package •Except for heating and cooling equipment and appliances Energy Star Qualified Homes Thermal Bypass Inspection Checklist Envelope insulation meets or exceeds IECC 2009 •Renovations - fully fill existing cavities, insulation R=3.5/inch
Performance Path	Energy usage simulation (REM/Rate) - proposed building's energy usage costs are < "standard reference design" building Uses prescriptive requirements as a starting point and allows tradeoffs except for HVAC Doesn't include lighting	HERS Rating (REM/Rate) ≥ 3,000 sf HERS ≤ 65 < 3,000 sf HERS ≤ 70 Energy Star Qualified Homes Thermal Bypass Inspection Checklist	HERS Rating (REM/Rate) ≥ 2,000 sf HERS ≤ 80 < 2,000 sf HERS ≤ 85 Energy Star Qualified Homes Thermal Bypass Inspection Checklist

32

Stretch Code Requirements

COMMERCIAL OVERVIEW

- Only for New Construction over 5,000 sf
New Buildings or Building additions
- Performance option for all Buildings
20% below ASHRAE 90.1-2007
- Prescriptive option for most building types
5,000 - 100,000 sf
- Exemptions (comply with base code)
Commercial buildings smaller than 5,000 sf
Special cases smaller than 40,000 sf (supermarkets, laboratories, and warehouses)
Commercial renovations and existing interior fit-outs
Historic buildings

33

Stretch Code Requirements

COMMERCIAL: ACCORDING TO BUILDING SIZE/TYPE

BUILDING SIZE

- **Over 100,000 sf** - Only Performance Option
 - Performance Option: Energy model showing 20% below ASHRAE 90.1-2007
- **5,000-100,000 sf** – Performance or Prescriptive Options
 - Performance Option: Energy model showing 20% below ASHRAE 90.1-2007
 - Prescriptive Option: Based on a revised IECC Ch.5 which is based on utility supported 'Core Performance' program. The prescriptive option includes three options: heating and cooling equipment improvements, improved lighting efficiency, or ≥ 3% of electric needs to come from on-site renewable energy sources.

34

Commercial Compliance Summary

Commercial Compliance Paths		
	New Building Code (IECC 2009)	Stretch Code New Construction
Prescriptive Path	Requirements for <ul style="list-style-type: none"> • Envelope insulation values • Fenestration U Values and SHGC • HVAC System Selection • Lighting power density 	Option for buildings 5,000 sf to 100,000 sf Mandatory requirements <ul style="list-style-type: none"> • Envelope • Mechanical systems • Service water heating • Electrical power and lighting 3 Compliance Paths <ul style="list-style-type: none"> • Higher efficiency HVAC equipment or • Further lighting power density reductions or • On-site renewable energy
Performance Path	Energy usage simulation - proposed building's energy usage costs are < "standard reference design" building Uses prescriptive requirements as a starting point and allows tradeoffs	Performance 20% better than ASHRAE 90.1-2007 •All buildings > 100,000 sf •Option for buildings 5,000 sf to 100,000 sf

35

STRETCH CODE WORKSHOP

- Introduction, *Louis Hasbrouck*
- Introduction to the Stretch Code, *Jim Barry*
- The HERS Rating System, *Mark Price*
- Stretch Code Requirements, *Dan Hellyer*
- **Building Code Requirements, Louis Hasbrouck**
- Projected Costs, *Del Smith*
- Closing Remarks, *Chris Mason*

36

Building Code Requirements for Stretch Code

- Building department is first point of contact
 - We will explain the specific requirements of the stretch code and direct people to a HERS rater
- Design modeling information or engineering reports and construction plans
 - presented with the building permit application for review prior to issuing a building permit
- Building official will verify foundation and slab insulation prior to back filling

37

Building Code Requirements for Stretch Code

- Building official will inspect framing prior to insulation and verify that all structural air sealing requirements are completed (wiring, plumbing and duct penetrations, and fire separation walls) and that duct sealing is complete
- Building official will inspect insulation and air sealing, and verify that the thermal bypass checklist requirements are complete
- The HERS rating report must be submitted prior to the final inspection
- HERS certification or a building commissioning report is required prior to issuing the certificate of occupancy

38

STRETCH CODE WORKSHOP

- Building Code Requirements, *Louis Hasbrouck*
- Introduction to the Stretch Code, *Jim Barry*
- The HERS Rating System, *Mark Price*
- Stretch Code Requirements, *Dan Hellyer*
- **Projected Costs, *Del Smith***
- Closing Remarks, *Chris Mason*

39

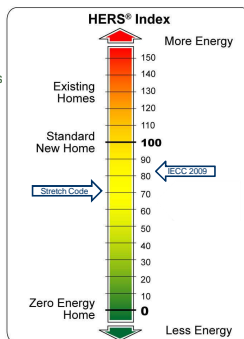
Construction Costs: New Building Code vs. Stretch Code



40

Construction Costs Example: Residential

- New Home – approx. 1500 sf, 2 Stories, Full Basement
 - Home meeting Prescriptive Requirements of the New Building Code Requirements (IECC 2009) earned a HERS rating of 82
 - Improvements Option 1: Add R5 rigid insulation to the exterior of the home, change the basement wall exterior insulation to R15, change the windows U value to 0.30 and put the ductwork under the attic insulation - HERS 70
 - Improvements Option 2: Change to a 92% efficient furnace, 14 SEER condensing unit and an 80% efficient on demand gas fired water heater - HERS 67
 - After improvements: HERS 70 which meets the requirements of the Stretch Code.



41

Construction Costs Example: Residential

- Case Study – New Home

Study Title	Average Cost Premium %	Average Cost Premium \$/sf	Notes
Energy Star Case Study on Blue Hills, Kansas City, Missouri	1.6%	\$1.60	\$ 2,500 to \$ 5,000 construction cost premium including HERS rating \$ 160,000 total construction cost \$ 500 annual energy savings 1,540 sf homes

42

Construction Costs Example: Residential

• Additions, Alterations, Renovations and Repairs

Compliance Path	Stretch Code for Additions, Alterations, Renovations and Repairs	Cost Premium
Prescriptive Path	Conform to the most recent Energy Star for Homes Prescriptive Builders Option Package (BOP), except for heating and cooling equipment and appliances	Energy Star T-stat: No Cost Premium Ductwork Leakage and Insulation R-Values: No Cost Premium Energy Star Windows: No Cost Premium Energy Star Water Heater: No Cost Premium
	Comply with the Energy Star Qualified Homes Thermal Bypass Inspection Checklist.	No Cost Premium
	Envelope insulation meets or exceeds IECC 2009 (base code) For Alterations, Renovations and Repairs insulation shall fully fill existing cavities and shall meet or exceed an R value of R 3.5/inch.	No Cost Premium
Performance Path	HERS rating as required for new homes For Alterations, Renovations and Repairs > 2,000 sf - HERS 80 or less < 2,000 sf - HERS 85 or less	Depends...

43

Construction Costs Example: Commercial

Commercial Compliance Paths	
Stretch Code vs. New Construction	
Prescriptive Path	Envelope • Insulation values better than IECC Mechanical Systems • Same efficiencies as IECC • Commissioning is mandatory Service Water Heating • Same as IECC Electrical Power and Lighting • Requires automatic lighting controls for all buildings • Lower lighting power densities 3 Compliance Paths • Higher efficiency HVAC equipment or • Further lighting power density reductions or • On-site renewable energy
Performance Path	Performance 20% better than ASHRAE 90.1-2007 • All buildings > 100,000 sf • Option for buildings 5,000 sf to 100,000 sf

44

Construction Costs Example: Commercial

Study Title	Average Cost Premium %	Average Cost Premium \$/sf	Notes
Green Building Costs and Financial Benefits - Gregory H. Kats, October 2003	< 2%	\$3.00 to \$5.00	Majority due to increased soft costs
GSA LEED Cost Study - Steven Winter Associates, Inc., October 2004	1 to 8%	\$1.70 to \$13.60	Average Construction cost \$170/sf
Greening America's Schools Costs and Benefits - Gregory Kats, October 2006	1% to 2%	\$1.76 to \$3.52	---
Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption - Davis Langdon, July 2007	0%	\$0	---
The Cost of Green in New York City - Urban Green Council, October 1, 2009	0%	\$0	Average Construction cost \$440/sf

45

Construction Costs Example: Commercial

- 0% to 8% or \$0/sf to almost \$14/sf.
- Why such a broad range?
 - Variations in the types of buildings studied
 - Different "green" design features incorporated in various projects
 - Dates of the studies
- **Caution!**
 - LEED NC and LEED H projects may include "green" design features not required by the new building code or stretch code and may be a cost premium

46

Construction Costs Example: Commercial

• What's related to Energy efficiency?

Energy and Atmosphere Credit	Cost Premium
Fundamental Building Systems Commissioning	\$1.00/sf
Optimize Energy Performance • Assumes project is obtaining 2-5 points to get minimum of 20% improvement over ASHRAE 90.1 • Includes energy modeling costs	\$2.00/sf
Renewable Energy	\$3.00/sf
Enhances Commissioning	\$0.15/sf
Total Cost Premium for EA Credits	\$6.15/sf (3.5%)

47

Energy Savings: New Building Code vs. Stretch Code

48

What is the Energy Saving Target?

- Prescriptive Approach
 - No guarantee of energy savings
- Performance Based Approach
 - Residential HERS rating requirements:
 - 65 for new homes $\geq 3,000$ sf
 - 70 for new homes $< 3,000$ sf
 - 80 for renovations $\geq 2,000$ sf
 - 85 for renovations $< 2,000$ sf
 - Commercial: 20% improvement over ASHRAE 90.1-2007

49

What are Average Annual Energy Costs?

- Performance Based Approach
 - HERS rating of 100 represents a typical new home
 - A HERS rating of 70 (Stretch Code requirement for a new home $< 3,000$ sf) represents a 30% improvement in energy consumption compared to a typical new home
 - What does a typical new home use for energy annually?

50

What are Average Annual Energy Costs?

- U.S. Energy Information Administration
 - 2005 Residential Energy Consumption Survey
 - Average housing unit in New England uses \$0.98/sf
 - Case Study: New Home (1,500 sf)

Cost of Energy Consumption (1,500 sf new home)		
	Annual Energy Cost (\$/sf)	Annual Energy Cost (\$)
New England Average	\$0.98	\$1,470
HERS 70	\$0.67	\$1,005
Total Energy Savings	\$0.31	\$465

51

What are Average Annual Energy Costs?

- ▶ Energy Star Target Finder
 - Applicable to commercial projects
 - Will provide annual energy consumption cost vs. an average building of the same type and size

52

What are Average Annual Energy Costs?

- ▶ Energy Star Target Finder

53

What are Average Annual Energy Costs?

- ▶ Energy Star Target Finder

54

What are Average Annual Energy Costs?

Energy Star Target Finder

Results

Target Energy Performance Results

The design must achieve a rating of 75 or higher to be eligible for "Designed to Exceed the ENERGY STAR"

View Statement of Energy Design Intent

NOTE: Assumptions are 20% Electricity - Grid/Purchase and 80% Natural Gas. The Target is Average Building energy use for this facility are calculated based on the typical values in the zip code specified.

Energy	Design	Target	Average Building
Energy Performance Ratio (EPR)	N/A	50	50
Energy Reduction (%)	N/A	0	0
Source Energy Use Intensity (kBtu/sq. ft./yr)	N/A	204	204
Site Energy Use Intensity (kBtu/sq. ft./yr)	N/A	124	124
Total Annual Source Energy (kBtu)	N/A	10,180,075	10,180,075
Total Annual Site Energy (kBtu)	N/A	6,204,007	6,204,007
Total Annual Energy Cost (\$)	N/A	\$ 144,267	\$ 144,267
Carbon Emissions			
CO ₂ -eq Emissions (Metric Tons/yr)	N/A	444	444
CO ₂ -eq Emissions Reduction (%)	N/A	0%	0%

Facility Information

Elementary School
Orange, MA 01365
Grade School

Facility Characteristics	Est	Estimated Energy Usage	Est
Space Type	Grade School Area (Sq. Ft.)	Energy Source	Estimated Total Annual Energy Use
K-12 School	50,000	Electricity - Grid	\$ 0.0474884
Total Grade School Area	50,000	Purchase	\$ 0.0158886
		Natural Gas	\$ 0.0158886

*The Average Building is equivalent to an EPA Energy Performance Rating of 50.

Source: Data adapted from DOE EIA, See EPA [Energy Saver](#)

What are Average Annual Energy Costs?

Energy Star Target Finder

Location	Facility Type	Area (sf)	Annual Energy Consumption ¹ (\$)	20% Savings (\$)	20% Savings (\$/sf)
Orange, MA	K-12 School	50,000	\$144,267	\$28,853	\$0.58
Orange, MA	Office	8,000	\$25,023	\$5,005	\$0.63
Orange, MA	Bank	10,000	\$37,854	\$7,571	\$0.76
Orange, MA	Retail	5,000	\$12,952	\$2,590	\$0.52
Orange, MA	High School	300,000	\$674,130	\$134,826	\$0.45

1. Based on Energy Star Target Finder Target Level of 50

Summary of Cost Issues: New Building Code vs. Stretch Code

Cash-Flow for HERS 60 new home: 2,672 square feet, 3 bedrooms

Note: The HERS Stretch Code requirement is 70 or less for a home of this size (<3,000 sf).
(Mortgage Interest Rate = 5%, Loan Term = 30 years)

Description	Annual Costs	Monthly Costs
Total Improvement Costs	\$9,000	
Mortgage Payment Increase	\$580	\$48
Energy Costs before Improvements	\$3,103	\$259
Energy Cost after Improvements	\$1,739	\$145
Energy Cost Savings	\$1,364	\$114
Mortgage Payment Increase	\$580	\$48
Energy Cost Savings	\$1,364	\$114
Total Savings	\$784	\$66

expenses in red, savings in green

Include the cost of a HERS Rater, rebates, incentives and credits

Description	Cost
Total Improvement Costs (from previous example)	+ \$9,000
HERS Rater	+ \$1,500
Energy Star	- \$1,250
Gas Furnace - Utility Company Rebate	- \$1,000
Water Heater - Utility Rebate	- \$300
MA HERS Rater Rebate	- \$750
Federal Tax Rebate for Energy Efficient Appliances	- \$1,500
Total Additional Expenses, Rebates, Incentives and Credits	- \$3,300
Total Improvement Costs (from previous example)	+ \$9,000
Adjustments	- \$3,300
Adjusted Improvement Costs	+ \$5,700

expenses in red, savings in green

Cash-Flow for HERS 60 new home: 3,100 square feet

Note: The HERS Stretch Code requirement is 65 or less for a home of this size (≥3,000 sf).
(Mortgage Interest Rate = 5%, Loan Term = 30 years)

Description	Annual Costs	Monthly Costs
Total Improvement Costs	\$9,401	
Mortgage Payment Increase	\$606	\$51
Energy Costs before Improvements	\$3,600	\$300
Energy Cost after Improvements	\$2,018	\$168
Energy Costs Savings	\$1,582	\$132
Mortgage Payment Increase	\$606	\$51
Energy Cost Savings	\$1,582	\$132
Total Savings	\$976	\$81

expenses in red, savings in green

Case Study: Commercial Building

Mid-sized office building in Warwick, RI which meets the requirements of the Stretch Code for commercial properties (20% better than ASHRAE 90.1 2007)

Description	Cost
Total Improvement Costs	\$91,000
National Grid Rebates	- \$63,000
Adjusted Improvement Costs	\$28,000
Annual Energy Savings	\$29,000
Adjusted Improvement Costs	\$28,000
Annual Energy Savings	\$29,000
Net Cost of Improvements After 1 Year	\$1,000

expenses in red, savings in green

61

STRETCH CODE WORKSHOP

- Introduction, *Louis Hasbrouck*
- Introduction to the Stretch Code, *Jim Barry*
- The HERS Rating System, *Mark Price*
- Stretch Code Requirements, *Dan Hellyer*
- Building Code Requirements, *Louis Hasbrouck*
- Projected Costs, *Del Smith*
- Closing Remarks, *Chris Mason*

62

Summary of Benefits

Town Benefits

- Helps meet Northampton's energy and greenhouse goals
- Reduce operating costs and energy use in Northampton buildings
- Green Communities Funding can be used to:
 - Increase efficiency or add renewable energy to City buildings
 - Help offset the additional costs associated with the Stretch Code
 - Support energy retrofits in existing buildings
- Increases financial support through incentives, rebates and tax credits

Realtor Benefits

- High efficiency is a marketable feature

Economy & National Security

- Every dollar saved on energy stays in the local economy
- Creates local jobs
- Reduced dependence on foreign resources

63

Next Steps

- City Council holds a Public Hearing
- Vote of City Council

64